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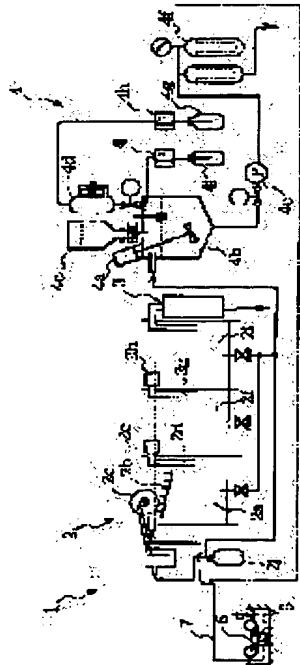
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(21)Application number : 2001-323007 (71)Applicant : NIPPON CLEAN OIL KK

(22)Date of filing : 22.10.2001 (72)Inventor : ABE HIDEHARU

(54) APPARATUS FOR SEPARATING/REMOVING OIL-WATER**(57)Abstract:**

PROBLEM TO BE SOLVED: To provide an apparatus for separating and removing oil-water capable of returning fully purified, treated water to the very site, by treating at a low cost the oil content in the oil-water below the standard value set for wastewater at an accident site.

SOLUTION: The oil-water separating and removing apparatus 1 comprises a float pump 5, a resistor plate 2b, an oil skimmer 2c, hydraulic pressure dispersing strainers 2e, 2h, an oil adsorbing filter 3, a floating-oil separation-recovery device 2 having a discharge port for the treated water and an oil-in-water content removal device 4, in a single housing. The float pump 5 removes refuse contained in the oil-water and pumps up the oily water near the surface. The resistor plate 2b controls the velocity of flow of the oil-water, and the oil skimmer 2c recovers the oil content floating onto the

floating-oil separating tank 2a. The hydraulic pressure dispersing strainers 2e, 2h draw the oil-water from the floating-oil separating tank 2a by siphons 2d, 2g and controls the oil-water flow in its velocity so as to enter the floating-oil separating tanks 2f, 2i while preventing the oil content from reaching the bottom. The oil adsorbing filter 3 adsorbs the oil content remaining as oil film. The aqueous oil removal device 4, after the oil content remaining in the oil-water is flocked using a flocculant and a coagulant, recovers and discharges the treated water.

[Claim(s)]

[Claim 1]An oily water separation removal device which installed an underwater oil stripper in one housing, and enabled loading of it at a marine vessel, vehicles, and a movable matter object of a train, comprising:

A float pump which removes garbage and pumps up only oily water of the surface neighborhood with much oil, The first floated oil separation tub that formed an oil skimmer which collects a baffle which controls the rate of flow of oily water not to make oil which surfaces on the pumped-up oily water surface reach to a pars basilaris ossis occipitalis, and oil which surfaced, The second, the third floated oil separation tub which formed a water pressure distribution strainer which controls the rate of flow not to carry out intensive fall of the oil in a siphon which pumps up oily water from a floated oil separation tub, and pumped-up oily water to a pars basilaris ossis occipitalis, A floated oil separate recovery device which provided an injection hole which emits an oil adsorption filter which adsorbs oil which may be contained also in emergency using adsorption material of porosity nature which consists of activated carbon, and treated water which carried out adsorption treatment of the oil into the third floated oil separation tub.

A detergent of a vegetable system which emulsion-izes oil which remains in oily water in said floated oil separation tub by an effect of micell.

A tank which throws in a coagulant which made main a food additive of a flocculating agent and a cation system which used an extract extracted from vegetation, such as seaweed which flocculates emulsion-ized oil, and which can be eaten, as the main ingredients, and is mixed, An injection hole which emits a bag filter which collects flocculated oil, and treated water from which flocculated oil was removed.

[Claim 2]The oily water separation removal device according to claim 1 constituted from an adsorption material escape prevention filter into which oil which absorbed an oil adsorption filter to a porous stream distributor which distributes oily water, adsorption material of porosity nature which consists of activated carbon located downstream from this stream distributor, and adsorption material located downstream from this adsorption material is not made to flow.

[Claim 3]A floated oil separate recovery device which laid the second and third floated oil separation tubs in L shape for a start, and the oily water separation removal device according to claim 1 or 2 which installed an underwater oil stripper near this floated oil separate recovery

device.

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention separates, collects and removes the oil which spread in sea water, a lake, etc. by the accident in an accident site, and relates to the oily water separation removal device which fills the effluent standard value of Water Pollution Control Law and which purifies the oil in oily water to a standard.

[0002]

[Description of the Prior Art]In the former, most of removal for the oil of the polluted sea water or a lake and cleaning of the oily water in the oily water separation tub specified to Fire Service Law, The oil-contaminated water which collected oil-contaminated water using the vacuum and the float suction, and was collected on land was transported and processed, or the ocean space where an oil spreads was surrounded with the oil fence, and the method which oil is adsorbed using adsorbing mats, or sprinkles a neutralizer on the oily water surface, has adsorbed oil enough and carries out it was adopted.

[0003]In addition, like the chemical disposal method which processes the oil in oily water as flocks using medicine, and an invention given in JP,6-10334,A, By the physical disposal method which passes filters, such as a perforated plate and glass wool, and removes oil, the oil separator which processes oil-contaminated water is also known.

[0004]

[Problem(s) to be Solved by the Invention]However, when oil has spread in extensive ocean space by the accident etc., oil-contaminated water is collected and huge cost starts by the method of transporting to land and processing. The method of surrounding the ocean space where oil spreads with an oil fence, sprinkling a neutralizer, and removing oil also needed a huge amount of time and expenses, and was not a realistic disposal method.

[0005]The handling of the amount of the medicine used, directions for use, etc. is difficult, medicine accumulates into the waste made into flocks to the seabed, and saying that environment is not affected in particular in the chemical disposal method processed as flocks using medicine, cannot be finished. Even if it is a case where the oil floating on the water surface is made to emulsify using a neutralizer, biodegradation of an emulsifier and the emulsified oil is carried out with neither photooxidation, nor fish and shellfishes, etc., but an oil processing agent remains after processing, and we cannot finish saying that it does not become a pollution source again, and are anxious

about the influence on environment.

[0006]Even after removing oil in the physical disposal method using filters, such as the conventional perforated plate, it was difficult for a detailed oil film to remain in the water surface, and to defecate sea water thoroughly.

[0007]Then, in [this invention was originated in view of many situations of description, and] a leakage oil accident site, Without lessening a throughput, reducing a cleanup cost, removing the oil in oily water as a harmless solid thoroughly, and also remaining a detailed oil film, oily water is processed below to the specified effluent standard value, and it aims at providing the possible oily water separation removal device of returning treated water to the spot.

[0008]

[Means for Solving the Problem]In order to solve the above-mentioned technical technical problem, a means of an invention indicated to claim 1, In an oily water separation removal device which are collected [which collects and separates oil under oilbearing wastewater] and is removed, A float pump which removes garbage and pumps up only oily water of the surface neighborhood with much oil, The first floated oil separation tub that formed an oil skimmer which collects a baffle which controls the rate of flow of oily water not to make oil which surfaces on the pumped-up oily water surface reach to a pars basilaris ossis occipitalis, and oil which surfaced, The second, the third floated oil separation tub which formed a water pressure distribution strainer which controls the rate of flow not to carry out intensive fall of the oil in a siphon which pumps up oily water from a floated oil separation tub, and pumped-up oily water to a pars basilaris ossis occipitalis, A floated oil separate recovery device which provided an injection hole which emits an oil adsorption filter which adsorbs oil which may be contained also in emergency using adsorption material of porosity nature which consists of activated carbon, and treated water which carried out adsorption treatment of the oil into the third floated oil separation tub, A detergent of a vegetable system which emulsion-izes oil which remains in oily water in said floated oil separation tub by an effect of micell, A tank which throws in a coagulant which made main a food additive of a flocculating agent and a cation system which used an extract extracted from vegetation, such as seaweed which flocculates emulsion-ized oil, and which can be eaten, as the main ingredients, and is mixed, An underwater oil stripper which provided an injection hole which emits a bag filter which collects flocculated oil, and treated water from which flocculated oil was removed is installed in one housing, and it is,

without making loading possible at a marine vessel, vehicles, and a movable matter object of a train.

[0009]Only oily water of the surface neighborhood with much oil, such as sea water which contains oil by oily water stored in an oily water separation tub etc. which are specified to Fire Service Law, a leakage oil accident, etc., is pumped up with a float pump, the amount of oily water to process is lessened as much as possible, and a cleanup cost is reduced. He removes garbage etc. beforehand out of oily water, and is trying not to bar circulation of oily water with garbage etc.

[0010]While the rate of flow is controlled by a baffle so that oil in oily water does not reach directly to a pars basilaris ossis occipitalis, and oily water flows into the first floated oil separation tub with it, surfacing of oil is promoted by specific gravity difference of moisture and oil, and oil carries out floatation of it to the oily water surface. An oil skimmer recovers oil which surfaced and it is removed out of oily water.

[0011]Next, oil pumps up oily water removed by an oil skimmer by a siphon from the first floated oil separation tub, the rate of flow is controlled by a water pressure distribution strainer so that oily water does not carry out intensive fall to a pars basilaris ossis occipitalis, and it flows into the second floated oil separation tub, and carries out by using detailed oil as an oil film that it is easy to carry out floatation. And oily water is circulated from the second floated oil separation tub to the third floated oil separation tub, and the same operation is repeated.

[0012]Thus, repeating the same operation from the second floated oil separation tub to the third floated oil separation tub to the second floated oil separation tub from the first floated oil separation tub, It is to keep oil from reaching emergency at the third floated oil separation tub that is the last tub, and floatation also of the very detailed oil in oily water is thoroughly carried out to the upper surface of oily water as an oil film according to specific gravity difference with moisture by repeating this operation.

[0013]An oil film which carried out floatation out of oily water is circulated in an oil adsorption filter using adsorption material of porosity nature which consists of activated carbon with oily water, While an oil adsorption filter also adsorbs and removes a detailed oil film of several difficult micron unit of removal and defecating oily water below to a specified effluent standard value, clear treated water in which an oil film does not remain is emitted to the spot from a floated oil separate recovery device.

[0014]Oil which floatation is not carried out with a floated oil separate recovery device, but remains in oily water, In an underwater oil stripper, form oily water into RIEMARU John with a detergent of a vegetable system, and it is considered as stable micell, After throwing in and flocculating a coagulant which made main a flocculating agent and a food additive of a cation system which used as the main ingredients an extract extracted from vegetation, such as seaweed which can be eaten, Treated water which removed oil thoroughly out of oily water, and was thoroughly defecated below to a specified effluent standard value is emitted to the spot from an underwater oil stripper.

[0015]From using a natural product not affecting, all detergents, the flocculating agents, and coagulants use flocculated oil as a harmless solid, and abandonment and removal can carry out environment in comfort.

[0016]A means to connect and circulate through a floated oil separate recovery device and an underwater oil stripper is formed, oil which remains without carrying out floatation to restoration water in a floated oil separation tub is defecated by an underwater oil stripper, and it is reusing as initial restoration water.

[0017]A porous stream distributor with which the invention according to claim 2 distributes oily water for an oil adsorption filter, It is without constituting from an adsorption material escape prevention filter into which oil absorbed to adsorption material of porosity nature which consists of activated carbon located downstream from this stream distributor, and adsorption material located downstream from this adsorption material is not made to flow.

[0018]A porous stream distributor distributes oil which carried out floatation as a detailed oil film of several micron unit, and it prevents so that oily water may be concentrated on one place and it may not circulate, It circulates to adsorption material which consists of activated carbon uniformly [abbreviation], adsorption treatment also of the difficult detailed oil film of removal is carried out to it, and pure treated water in which an oil film does not remain is emitted to the spot.

[0019]If it is in the invention according to claim 3, in addition to composition of the invention according to claim 1 or 2, it is in a floated oil separate recovery device which laid the second and third floated oil separation tubs in L shape, and this floated oil separate recovery device for a start, without installing an underwater oil stripper nearby.

[0020]It is made easy for it not to be in-series, to lay the second and third floated oil separation tubs in L shape, to make small area required for

installation of an oily water separation removal device as much as possible by having installed an underwater oil stripper near said floated oil decollator, and to carry in vehicles, a marine vessel, etc. for a start.

[0021]

[Embodiment of the Invention]Hereafter, one example of this invention is described, making a drawing reference. Drawing 1 is an explanatory view showing the outline composition of an oily water separation removal device.

[0022]As shown in drawing 1, the oily water separation removal device 1 comprises the floated oil separate recovery device 2 which makes the upper part carry out floatation of the oil with light specific gravity in oily water and from which it is removed, and the underwater oil stripper 4 which removes eventually the oil which does not carry out floatation but remains in oily water as a harmless solid.

[0023]The oily water which stored drawing 2 for cleaning of the oily water separation tub etc. which are specified to Fire Service Law, The oily water of the surface neighborhood with much oil in the oily water which spreads in sea water by a leakage oil accident etc. is pumped up, It is a figure showing the outline composition of the float pump 5 made to flow into the first floated oil separation tub 2a of the floated oil separate recovery device 2, and (a) is a top view of the float pump 5, and (b) is a side view of the float pump 5.

[0024]The float part 5a to which the float pump 5 holds the float pump 5 during oilbearing wastewater as shown in drawing 2, 5 d of suction ports which suck in oily water with much surface oil in a pump drive, and the meshes of a net which remove the big and rough comfort which allotted the circumference of 5 d of these suction ports size-coming, and softening and removing -- the net 5b -- **** -- the detailed comfort which was removed and was allotted to the circumference of 5 d of suction ports inside the net 5b is removed -- **** -- it removes and comprises the net 5c.

[0025]the oilbearing wastewater stored into the oily water separation tub 6 specified to Fire Service Law -- **** -- it removes and garbage is removed with the nets 5c and 5d, and only the oily water of the oilbearing wastewater surface with much oil is pumped up with the float pump 5, and flows into the first floated oil separation tub 2a.

[0026]Thus, in order to remove the garbage in oily water beforehand, in the floated oil separate recovery device 2, work is done efficiently, without barring circulation of oily water with garbage.

[0027] Since only the oily water of the oilbearing wastewater surface with much oil is pumped up and processed with the float pump 5 even if it is a case where oil spreads in sea water by an accident, the amount of oily water to process decreases and a cleanup cost can be reduced.

[0028] Drawing 3 is an enlarged drawing showing the floated oil separate recovery device 2. The first floated oil separation tub 2a is provided with the oil skimmer 2c which collects resisting plate 2b which is a baffle which controls the rate of flow of the oily water pumped up with the float pump 5, and the oil which surfaced. Drawing 4 is a perspective view showing the outline composition of resisting plate 2b.

[0029] As shown in drawing 4, resisting plate 2b on the flabellate plate 20 installed a little aslant. Two or more filters 21 are ***** (ed), the flank of this filter 21 is enclosed with the side plate 22, the oily water pumped up by the float pump 5 is circulated on resisting plate 2b, and it has become the structure which flows into the first floated oil separation tub 2a.

[0030] The rate of flow is controlled so that the oil in oily water does not reach [whether the oily water pumped up with the float pump 5 is beaten to resisting plate 2b, and] directly to the pars basilaris ossis occipitalis of the first floated oil separation tub 2a, and the floatation of oil is promoted.

[0031] And the oil which made the oil which surfaced on the water surface adhere to the cylindrical oil skimmer 2c rotated to the inflow direction and opposite direction of oily water using the viscosity of oil, and adhered to the oil skimmer 2c is collected to the oil recovery tank 2i. [0032] Subsequently, the oily water from which a part for floated oil was removed with the oil skimmer 2c is pumped up from the pars-basilaris-ossis-occipitalis neighborhood of the first floated oil separation tub 2a by the siphon 2d, It circulates to 2 f of second floated oil separation tub, carrying out conduction to the suction filter of about 40 meshes of the water pressure distribution strainer 2e, controlling the rate of flow of oily water, and preventing the intensive fall to the pars basilaris ossis occipitalis of oil. Here, the floatation of the oil in oily water is promoted and the oil in oily water carries out floatation to the upper part of 2 f of second floated oil separation tub as an oil film.

[0033] By repeating operation in which similarly oil pumps up oily water from near the pars basilaris ossis occipitalis which is 2f of second floated oil separation tub by which floatation was carried out using the siphon 2g, carries out conduction of the water pressure distribution strainer 2h, and flows into the third floated oil

separation tub 2i, While preventing so that oil may not reach the third floated oil separation tub 2i that is the last tub, floatation also of the very detailed oil in oily water is thoroughly carried out to the upper surface of oily water as an oil film according to specific gravity difference with moisture.

[0034] Next, the oil adsorption filter 3 which removes the oil film on the surface of oily water which carried out floatation is explained.

[0035] Drawing 5 is a top view showing the stream distributor 3c used for the oil adsorption filter 3, and drawing 6 is an explanatory view showing the outline composition of the oil adsorption filter 3.

[0036] As shown in drawing 5, the stream distributor 3c is a disk body which has porosity.

[0037] As shown in drawing 6, the oil adsorption filter 3, It equipped with the stream distributor 3c into the cylindrical owner top case body 3b, and was filled up with the adsorption material 3d which used activated carbon in the lower stream, and also has equipped with the adsorption material escape prevention filter 3e which is a disk body made from the polypropylene which prevents the outflow of the oil which stuck to the adsorption material 3d downstream.

[0038] The adsorption material 3d is using SUMIREI whose Taniguchi company incorporated company is manufacture and a selling agency and which uses activated carbon as the main raw material. SUMIREI is suitable for adsorption of the oil which is small, and it is 20 micrometers - about 50 micrometers in size, and is filmier than the aperture (the aperture of the usual oil-adsorption mat: 200 micrometers - 600 micrometers) of the adsorption material used for a common oil adsorption mat at a major-diameter hole.

[0039] The oil adsorption filter 3 of this example has equipped with the set which consists of the stream distributor 3c, the adsorption material 3d, and the adsorption material escape prevention filter 3e into two sets and the case body 3b. As for the case body 3b, forming using firm metal etc. is desirable so that it may become exchangeable [this set].

[0040] It will distribute [whether oily water strikes to the stream distributor 3c and], oily water will circulate uniformly [abbreviation in the adsorption material 3d], and the oily water to which the oil film has surfaced in the upper part will be adsorbed by the adsorption material 3d in an oil film, if it circulates in the oil adsorption filter 3. And the oily water which circulated from the adsorption material escape prevention filter 3e circulates the set [second more] stream distributor 3c, the adsorption

material 3d, and the adsorption material escape prevention filter 3e, thoroughly, it adsorbs and an oil film is removed from oily water.

[0041]Therefore, even if it is a case where oil is carrying out floatation to the oily water surface, as a detailed oil film of several difficult micron unit of removal, While oil is removed below at the effluent standard value (5 ppm of straight mineral oil, 30 ppm of vegetable oil) which adsorbed the oil film and was specified in the oil adsorption filter 3, the clear treated water in which an oil film does not remain, either can be emitted to the spot.

[0042]Next, according to specific gravity difference, oil does not carry out floatation but explains the underwater oil stripper 4 which removes the oil which remains in oily water.

[0043]As shown in drawing 1, the underwater oil stripper 4 equips with the hopper 4c for a flocculating agent B injection, and the volume check tank 4d for a coagulant C injection the stirring tank 4b which has the agitating equipment 4a, and arranges the bag filter 4f via the filtration pump 4e. Among a figure, it is a tank of the coagulant C, and 4 g sucks up coagulant C fluid with the pump 4h from this tank 4g, by the volume check tank 4d, it checks volume and supplies it to the stirring tank 4b. The inside 4i of a figure is a tank of the detergent A, and feeds optimum dose of detergents A into the stirring tank 4b with the optimum dose pump 4j.

[0044]The detergent A is a vegetable detergent using trade name ion cleaning agent SNF-GF88 which the limited company S-N-E research institute manufactured. The flocculating agent B is the powdery part which used as the main ingredients the extract extracted from vegetation, such as seaweed which can be eaten, and the coagulant C is the fluid which made the food additive of a cation system main. In the incorporated company waste tech, Sind, Inc. is using NBP-A of a selling agency, and BC9-B (it is general term MIKIROSHIKU by 2 sets) for the flocculating agent B and the coagulant C in the manufacturer.

[0045]With the floated oil separate recovery device 2, oil with light specific gravity the oily water by which floatation was carried out, It flows into the stirring tank 4b of the underwater oil stripper 4 through piping from the floated oil separation tubs 2a, 2f, and 2i, The oil which threw in the detergent A, formed oily water into RIEMARU John, and remains in oily water is made into stable micell, The oil which throws in the flocculating agent B and the coagulant C, and serves as micell was flocculated thoroughly, and also the treated water which removes this

flocculated oil with the bag filter 4f, in which oil does not remain and which was defecated thoroughly can be re-emitted to the spot from the injection hole of the underwater oil stripper 4.

[0046]From using the natural product not affecting, all the detergents A, the flocculating agents B, and coagulants C can use the flocculated oil as a harmless solid, and it can do abandonment and removal of environment in comfort.

[0047]In the floated oil separation tubs 2a, 2f, and 2i, the oil which surfaced was also flocculated in the underwater oil stripper 4, and also removing is also possible. Namely, restoration water is supplied from the lower part of the floated oil separation tubs 2a, 2f, and 2i, Floated oil is made the upper part of the floated oil separation tubs 2a, 2f, and 2i, and it flows into the stirring tank 4b of the underwater oil stripper 4 with the floated oil separation tubs 2a and 2f and the top recovery pipes 7 provided in 2i upper part, and oil was flocculated, and also it collects and separation abandonment is carried out.

[0048]The circulation means which connected the floated oil separate recovery device 2 and the underwater oil stripper 4 for the piping 7 via the circulation valve is formed, the underwater oil stripper 4 is made to circulate through the floated oil separation tubs 2a and 2f which have become dirty, and the restoration water in 2i through the pipe 8 through a circulation valve, and they are reused as pure initial restoration water.

[0049]Next, drawing 7 describes other examples of the oily water separation removal device 1. Drawing 7 is a top view showing the oily water separation removal device 1 which connected the floated oil separate recovery device 2 and the underwater oil stripper 4 for the piping 7, constituted one line, and was installed in housing.

[0050]As shown in drawing 7, the oily water separation removal device 1 The first of the floated oil separate recovery device 2, Install the second and third floated oil separation tubs 2a, 2f, and 2i in L shape, and The first of this floated oil separate recovery device 2, The second and third floated oil separation tubs 2a, 2f, and 2i are connected with the stirring tank 4b for the piping 7 via a circulation valve, the underwater oil stripper 4 is installed near the floated oil separate recovery device 2, and is provided, and it is installing in housing compactly.

[0051]For this reason, to the accident site of the sea water which it became easy to carry the oily water separation removal device 1 in vehicles or a marine vessel, and was polluted by the accident etc., or a lake, The oily water separation removal

device 1 carried in vehicles or a marine vessel can be carried, it can purify at the spot below to the effluent standard value to which oily water was specified, and the defecated treated water in which an oil film does not remain can be returned to the spot.

[0052]

[Effect of the Invention] Since this invention has the above-mentioned composition, it does so the effect taken below. Even if an oily water separation removal device is a case where oily water has spread in large areas, such as sea water, in order to pump up and process the oily water of the surface neighborhood of oily water with much oil, it can lessen the amount of oily water to process, and can reduce a cleanup cost.

[0053] While the floated oil separate recovery device of an oily water separation removal device carries out floatation of the oil in oily water according to the specific gravity difference of oil and moisture and collecting them -- the inside of oily water -- ** -- floatation also of the detailed oil is carried out as an oil film, and it is removed. Even if it is a case where the oil which does not carry out floatation as an oil film should remain in oily water, it can remove using an oil adsorption filter, oily water can be thoroughly purified below to the specified effluent standard value, and the clear treated water in which oil does not remain as an oil film can be returned to the spot.

[0054] The underwater oil stripper of an oil separator can return the treated water which carried out recovery and removal by having used as the harmless solid the oil which remains in the oily water by which floatation is not carried out with a floated oil separate recovery device, and was thoroughly defecated below to the specified effluent standard value to the spot.

[0055] Since an oily water separation removal device can be compactly installed in housing and carrying in mobiles, such as a marine vessel, easily is possible, an oily water separation removal device is carried to an accident site, In the accident site of leakage oil, while removing the oil in oily water, such as sea water, thoroughly and defecating oily water below to the specified effluent standard value, without affecting environment by low cost, the treated water in which oil does not remain as an oil film and which was defecated thoroughly can be re-emitted to the spot.

[Brief Description of the Drawings]

[Drawing 1] The explanatory view showing the outline composition of the oily water separate recovery device in which one example of this invention is shown.

[Drawing 2] As for (a), the top view showing the

outline composition of a float pump and (b) are the side views of a float pump.

[Drawing 3] The explanatory view showing the outline composition of the floated oil separate recovery device in which one example of this invention is shown.

[Drawing 4] The perspective view showing the outline composition of a resisting plate.

[Drawing 5] The top view showing the outline composition of the stream distributor used for an oil adsorption filter.

[Drawing 6] The explanatory view showing the outline composition of an oil adsorption filter.

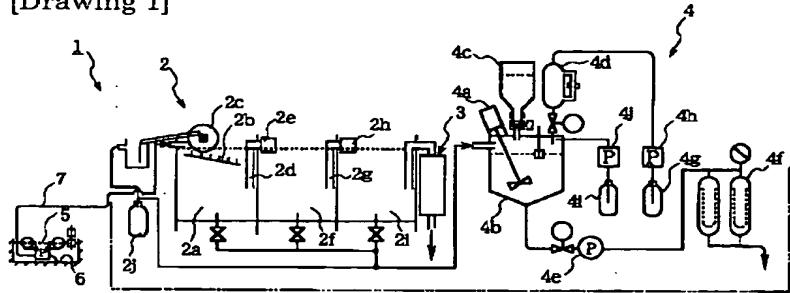
[Drawing 7] The explanatory view showing the outline composition of the oily water separation removal device which connected the floated oil separate recovery device and underwater oil stripper which show other examples of this invention at one line.

[Description of Notations]

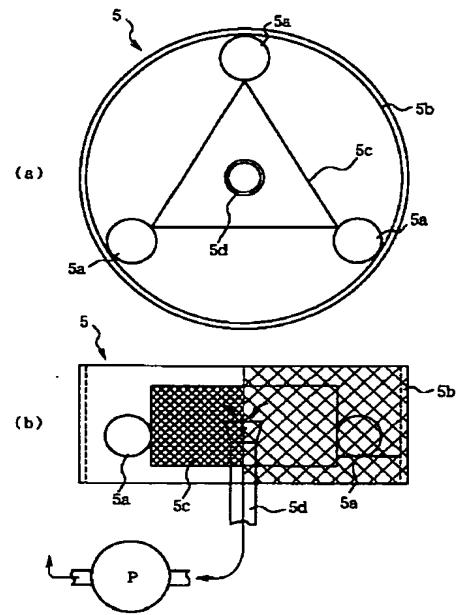
- 1 ; Oily water separation removal device
- 2 ; Floated oil separate recovery device
- 2a ; Floated oil separation tub
- 2b ; Resisting plate
- 2c ; Oil skimmer
- 2d ; Siphon
- 2e ; Water pressure distribution strainer
- 2f ; Floated oil separation tub
- 2g ; Siphon
- 2h ; Water pressure distribution strainer
- 2i ; Floated oil separation tub
- 2j ; Recovery tank
- 3 ; Oil adsorption filter
- 3a ; Siphon
- 3b ; Case body
- 3c ; Stream distributor
- 3d ; Adsorption material
- 3e ; Adsorption material escape prevention filter
- 4 ; Underwater oil stripper
- 4a ; Agitating equipment
- 4b ; Stirring tank
- 4c ; Hopper
- 4d ; Volume check tank
- 4e ; Filtration pump
- 4f ; Bag filter
- 4g ; Coagulant C tank
- 4h ; Pump
- 4i ; Detergent A tank
- 4j ; Optimum dose pump
- 5 ; Float pump
- 5a ; Float part
- 5b ; -- **** -- removing -- a net
- 5c ; -- **** -- removing -- a net
- 5d ; Suction port
- 6 ; Wastewater bit
- 7 ; Top recovery pipes
- 8 ; Pipe
- 21 ; Filter
- 22 ; Side plate
- 20 ; Monotonous

[Drawings]

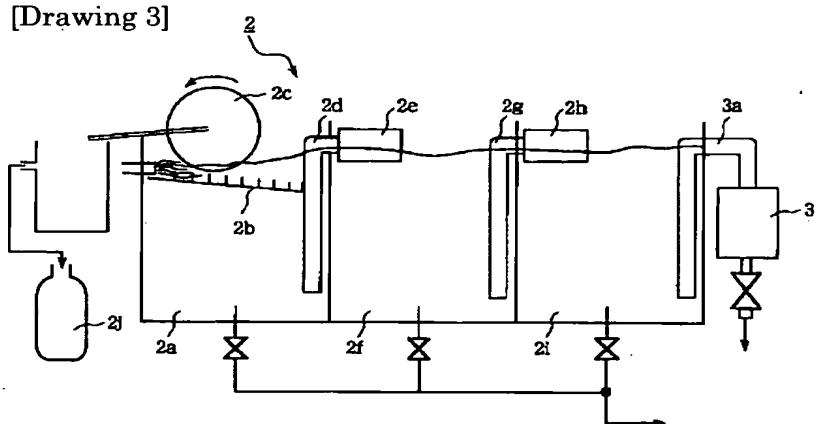
[Drawing 1]



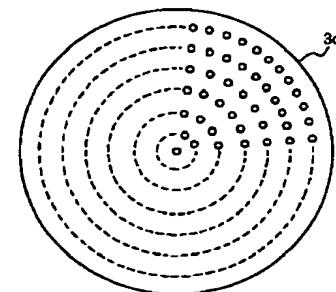
[Drawing 2]



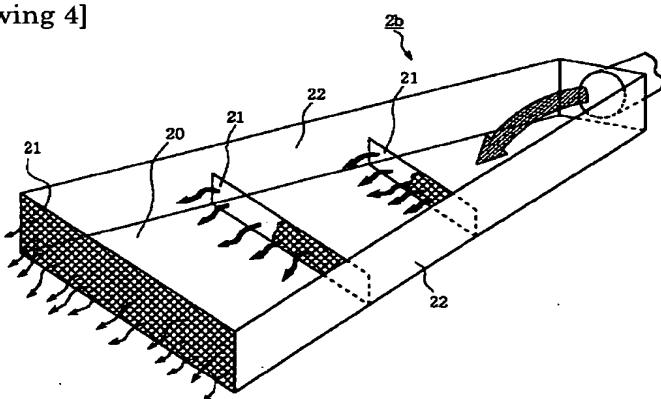
[Drawing 3]



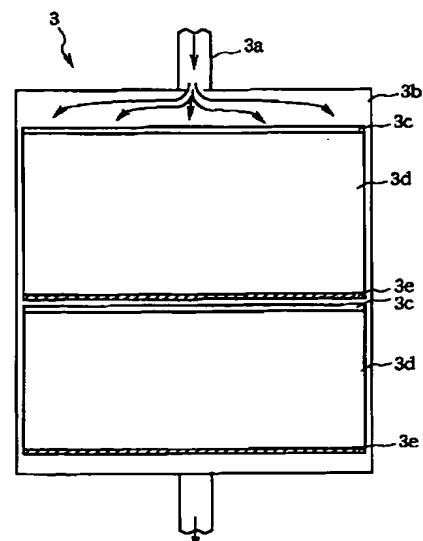
[Drawing 5]



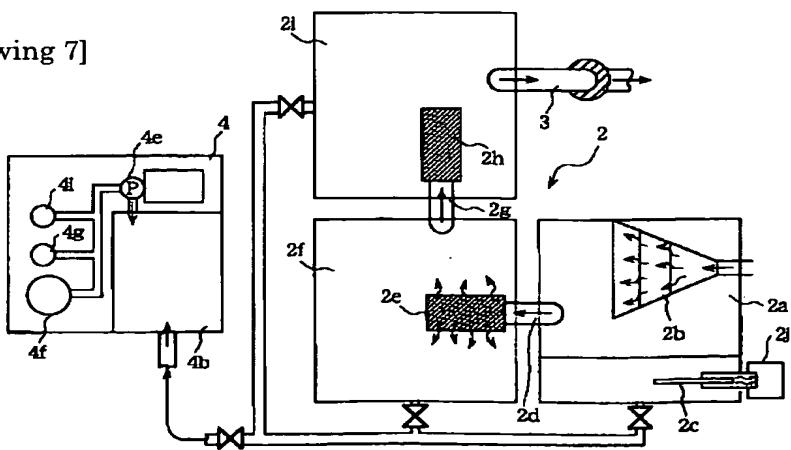
[Drawing 4]



[Drawing 6]



[Drawing 7]



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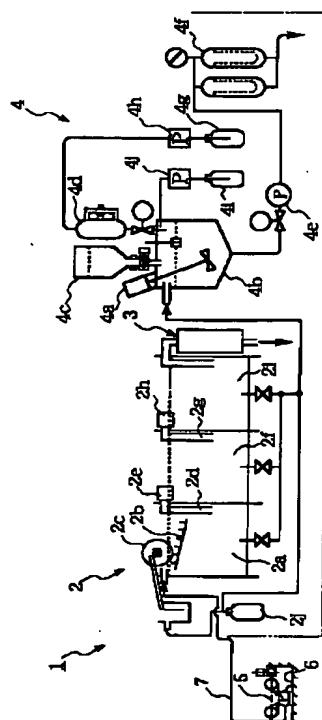
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(54)【発明の名称】 油水分離除去装置

(57)【要約】

【課題】 事故現場において、低コストで排水基準値以下まで油水中の油分を処理し、完全に清澄化した処理水を現場に戻すことのできる油水分離除去装置を提供することを目的とする。

【解決手段】 油水中のごみを除去して油分の多い表面附近の油水を汲み上げるフロートポンプ5、油水の流速を制御する抵抗板2b及び浮上油分離槽2aに浮上した油分を回収するオイルスキマー2c、浮上油分離槽2aから油水をサイホン2d, 2gで汲み上げて油分を底部まで到達させないように油水の流速を制御して浮上油分離槽2f, 2iに流入する水圧分散ストレーナー2e, 2h、油膜として残る油分を吸着する油吸着フィルター3、及び処理水の放出口を備えた浮上油分離回収装置2と、油水中に残る油分を洗浄剤と凝集剤と凝固剤とを用いてフロック化したうえ回収を行い、処理水を放出する水中油分除去装置4とを一つのハウジングに設けた油水分離除去装置1である。



【特許請求の範囲】

【請求項1】 ごみを除去して油分の多い表面附近の油水のみを汲み上げるフロートポンプ、汲み上げた油水表面に浮上する油分を底部まで到達させないように油水の流速を制御する邪魔板及び浮上した油分を回収するオイルスキマーを設けた第一の浮上油分離槽、油水を浮上油分離槽から汲み上げるサイホン及び汲み上げた油水中の油分を底部まで集中落下させないように流速を制御する水圧分散ストレーナーを設けた第二、第三の浮上油分離槽、第三の浮上油分離槽中に万一にも含まれている可能性のある油分を活性炭からなる多孔質性の吸着材を用いて吸着する油吸着フィルター、油分を吸着処理した処理水を放出する放出口を設けた浮上油分離回収装置と、前記浮上油分離槽中の油水中に残留する油分をミセルの効果によりエマルジョン化する植物系の洗浄剤と、エマルジョン化した油分をフロック化する食可能な海草等の植物から抽出したエキスを主成分とした凝集剤及びカチオン系の食品添加物をメインとした凝固剤とを投入して混合するタンク、フロック化した油分を回収するバグフィルター、フロック化した油分を除去した処理水を放出する放出口を設けた水中油分除去装置とを、一つのハウジングに設置し、船舶、車両、列車の移動物体に搭載可能とした油水分離除去装置。

【請求項2】 油吸着フィルターを、油水を分散する多孔性の水流分散板と、該水流分散板の下流に位置する活性炭からなる多孔質性の吸着材と、該吸着材の下流に位置する吸着材に吸収した油分を流出させない吸着材流出防止フィルターとから構成した請求項1記載の油水分離除去装置。

【請求項3】 第一、第二及び第三の浮上油分離槽をL字型に載置した浮上油分離回収装置と、該浮上油分離回収装置に水中油分除去装置を近設した請求項1又は2記載の油水分離除去装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は、事故により海水や湖沼等に広がったオイルを事故現場にて、分離、回収、除去し、水質汚濁防止法の排水基準値を満たす基準まで油中の油分を浄化する油水分離除去装置に関するものである。

【0002】

【従来の技術】 従来において、汚染された海水や湖沼のオイル分の除去や、消防法に規定されている油水分離槽における油水の清掃の殆どは、含油水をバキュームやフロートサクションを利用して回収し、陸地に回収した含油水を移送して処理したり、油の広がる海域をオイルフェンスで囲み、吸着マットを使用して油分を吸着したり、油水表面に中和剤を散布して油分を吸着したりする方法を採用していた。

【0003】 そのほか、油水中の油分を薬品を使用して

フロックとして処理する化学的な処理方法や、特開平6-10334号公報記載の発明のように、多孔板やグラスウール等のフィルターを通過させて油分を除去する物理的な処理方法により、含油水の処理を行う油水分離装置も知られている。

【0004】

【発明が解決しようとする課題】 しかし、事故等によりオイルが広範な海域に広がっている場合に、含油水を回収して陸地に移送して処理する方法では膨大なコストがかかる。また、オイルフェンスでオイルの広がる海域を囲み、中和剤を散布して油分を除去する方法も、膨大な時間と費用を必要とし、現実的な処理方法ではなかった。

【0005】 特に、薬品を使用してフロックとして処理する化学的な処理方法では、薬品の使用量や使用方法等の取扱いが難しく、フロックとした廃棄物中に薬品が海底に堆積して、環境に影響を与えないとはいきれない。また、水面に浮かんだ油分を中和剤を用いて乳化させた場合であっても、乳化剤及び乳化した油分が光酸化や魚介類等によって生分解されず、処理後に油処理剤が残留して再度汚染源にならないとはいきらず、環境への影響が懸念される。

【0006】 また、従来の多孔板等のフィルターを用いる物理的な処理方法では、油分を除去した後も、微細な油膜が水面に残ってしまい、海水を完全に清澄化することは困難であった。

【0007】 そこで、本発明は、叙述の諸事情を鑑みて創案されたもので、漏油事故現場において、処理量を少なくして処理コストを低減し、油水の油分を完全に無害固形物として除去し、微細な油膜をも残留することなく、規定された排水基準値以下まで油水を処理して、処理水を現場に戻すことの可能な油水分離除去装置を提供することを目的とする。

【0008】

【課題を解決するための手段】 上記技術的課題を解決するために、請求項1に記載した発明の手段は、含油排水中の油分を分離、回収、除去する油水分離除去装置において、ごみを除去して油分の多い表面附近の油水のみを汲み上げるフロートポンプ、汲み上げた油水表面に浮上する油分を底部まで到達させないように油水の流速を制御する邪魔板及び浮上した油分を回収するオイルスキマーを設けた第一の浮上油分離槽、油水を浮上油分離槽から汲み上げるサイホン及び汲み上げた油水中の油分を底部まで集中落下させないように流速を制御する水圧分散ストレーナーを設けた第二、第三の浮上油分離槽、第三の浮上油分離槽中に万一にも含まれている可能性のある油分を活性炭からなる多孔質性の吸着材を用いて吸着する油吸着フィルター、油分を吸着処理した処理水を放出する放出口を設けた浮上油分離回収装置と、前記浮上油分離槽中の油水中に残留する油分をミセルの効果により

エマルジョン化する植物系の洗浄剤と、エマルジョン化した油分をフロック化する食可能な海草等の植物から抽出したエキスを主成分とした凝集剤及びカチオン系の食品添加物をメインとした凝固剤とを投入して混合するタンク、フロック化した油分を回収するバグフィルター、フロック化した油分を除去した処理水を放出する放出口を設けた水中油分除去装置とを、一つのハウジングに設置し、船舶、車両、列車の移動物体に搭載可能としたこと、にある。

【0009】消防法に規定される油水分離槽などに貯留した油水、漏油事故等により油分を含む海水等の油分の多い表面附近の油水のみをフロートポンプで汲み上げ、処理する油水量をできるだけ少なくて、処理コストを低減する。また、油水中からあらかじめごみ等を除去して、ごみ等により油水の流通を妨げないようにしている。

【0010】油水は、邪魔板によって、油水中の油分が底部まで直接到達しないように流速が制御されて、第一の浮上油分離槽に流入するとともに、水分と油分との比重差により、油分の浮上が促進され、油分が油水表面に浮上分離する。浮上した油分は、オイルスキマーで回収し、油水中から除去する。

【0011】次に、油分がオイルスキマーによって除去された油水を、第一の浮上油分離槽からサイホンによって汲み上げ、底部まで油水が集中落下しないように水圧分散ストレーナーで流速を制御して、第二の浮上油分離槽に流入し、微細な油分を油膜として浮上分離させやすくする。そして、第二の浮上油分離槽から第三の浮上油分離槽に油水を流通して同様の操作を繰り返す。

【0012】このように、第一の浮上油分離槽から第二の浮上油分離槽へ、第二の浮上油分離槽から第三の浮上油分離槽へ、同様の操作を繰り返すのは、万が一にも最終槽である第三の浮上油分離槽に油分が到達するがないようにするために、この操作を繰り返すことによって、油水中の極微細な油分も、水分との比重差により、油膜として完全に油水の上部表面に浮上分離する。

【0013】油水中から浮上分離した油膜を、油水とともに、活性炭からなる多孔質性の吸着材を用いた油吸着フィルターに流通し、除去の困難な数ミクロン単位の微細な油膜をも油吸着フィルターにて吸着・除去し、規定された排水基準値以下まで油水を清浄化するとともに、油膜が残らない清澄な処理水を浮上油分離回収装置から現場に放出する。

【0014】浮上油分離回収装置で浮上分離されず、油水中に残留する油分は、水中油分除去装置において、植物系の洗浄剤で油水をリエマルジョン化して安定なミセルとし、更に、食可能な海草等の植物から抽出したエキスを主成分とした凝集剤とカチオン系の食品添加物とをメインとした凝固剤とを投入してフロック化したうえ、油分を油水中から完全に除去し、規定された排水基準値

以下まで完全に清澄化した処理水を水中油分除去装置から現場に放出する。

【0015】洗浄剤、凝集剤および凝固剤の全てが、環境に影響を与えない天然物を用いていることから、フロック化した油分を無害固形物として、安心して廃棄・除去できる。

【0016】なお、浮上油分離回収装置と水中油分除去装置を連結し循環する手段を設け、浮上油分離槽中の充填水に、浮上分離されずに残留する油分を水中油分除去装置で清浄化し、初期充填水として再利用している。

【0017】請求項2記載の発明は、油吸着フィルターを、油水を分散する多孔性の水流分散板と、該水流分散板の下流に位置する活性炭からなる多孔質性の吸着材と、該吸着材の下流に位置する吸着材に吸着した油分を流出させない吸着材流出防止フィルターとから構成したこと、にある。

【0018】数ミクロン単位の微細な油膜として浮上分離した油分を、多孔性の水流分散板によって分散し、油水を一箇所に集中して流通しないように防止して、活性炭からなる吸着材に略均等に流通し、除去の困難な微細な油膜をも吸着除去して、油膜の残留しない清浄な処理水を現場に放出する。

【0019】請求項3記載の発明にあっては、請求項1又は2記載の発明の構成に加え、第一、第二及び第三の浮上油分離槽をL字型に載置した浮上油分離回収装置と、該浮上油分離回収装置に水中油分除去装置を近設したこと、にある。

【0020】第一、第二及び第三の浮上油分離槽を直列ではなく、L字型に載置し、水中油分除去装置を前記浮上油分離装置に近設したことで、油水分離除去装置の設置に必要な面積を極力小さくし、車両や船舶等に搭載しやすくしている。

【0021】

【発明の実施の形態】以下、本発明の一実施例を、図面を参照しながら説明する。図1は、油水分離除去装置の概略構成を示す説明図である。

【0022】図1に示すように、油水分離除去装置1は、油水中の比重の軽い油分を上部に浮上分離させて除去する浮上油分離回収装置2と、浮上分離せず、油水中に残留する油分を最終的に無害固形物として除去する水中油分除去装置4とから構成されている。

【0023】図2は、消防法に規定される油水分離槽等の清掃のため貯留した油水や、漏油事故等により海水に広がる油水中の油分の多い表面附近の油水を汲み上げて、浮上油分離回収装置2の第一の浮上油分離槽2aに流入させるフロートポンプ5の概略構成を示す図であり、(a)は、フロートポンプ5の平面図、(b)は、フロートポンプ5の側面図である。

【0024】図2に示すように、フロートポンプ5は、含油排水中にフロートポンプ5を保持するフロート部5

aと、表面の油分の多い油水をポンプ駆動にて吸い込む吸い込み口5dと、該吸い込み口5dの周囲に配した粗大なごみを除去する網目の大きなごみ除け網5bと、ごみ除け網5bの内部で吸い込み口5dの周囲に配した微細なごみを除去するごみ除け網5cとから構成されている。

【0025】消防法に規定される油水分離槽6中に貯留された含油排水は、ごみ除け網5c、5dによりごみが除かれて、油分の多い含油排水表面の油水のみがフロートポンプ5で汲み上げられ、第一の浮上油分離槽2aに流入する。

【0026】このように、油水中のごみをあらかじめ除去しておくため、浮上油分離回収装置2において、油水の流通がごみで妨げられることなく、効率よく作業が進められる。

【0027】また、事故により海水にオイルが広がった場合であっても、油分の多い含油排水表面の油水のみをフロートポンプ5で汲み上げて処理するため、処理する油水量が少なくなり、処理コストを低減することができる。

【0028】図3は、浮上油分離回収装置2を示す拡大図である。第一の浮上油分離槽2aは、フロートポンプ5で汲み上げられた油水の流速を制御する邪魔板である抵抗板2b及び浮上した油分を回収するオイルスキマー2cを備えている。なお、図4は、抵抗板2bの概略構成を示す斜視図である。

【0029】図4に示すように、抵抗板2bは、やや斜めに設置した扇状の平板20に、複数のフィルター21を起立設し、このフィルター21の側部を側板22で囲って、フロートポンプ5により汲み上げられた油水を抵抗板2b上に流通させて、第一の浮上油分離槽2aに流入する仕組みとなっている。

【0030】フロートポンプ5で汲み上げられた油水は、抵抗板2bにぶつかって、油水中の油分が直接、第一の浮上油分離槽2aの底部まで到達しないように流速が制御され、油分の浮上分離が促進される。

【0031】そして、水面に浮上した油分を、油分の粘性を利用して、油水の流入方向と逆方向に回転する円筒状のオイルスキマー2cに付着させ、オイルスキマー2cに付着した油分を油分回収タンク2iに回収する。

【0032】次いで、オイルスキマー2cで浮上油分が除去された油水を、第一の浮上油分離槽2aの底部附近からサイホン2dで汲み上げ、水圧分散ストレーナー2eの40メッシュ程度のサクションフィルターに通流させて油水の流速を制御し、油分の底部への集中落下を防止しつつ、第二の浮上油分離槽2fに流通する。ここで、油水中の油分の浮上分離が促進され、油水中の油分が、油膜として第二の浮上油分離槽2fの上部に浮上分離する。

【0033】同様に、油分が浮上分離された第二の浮上

油分離槽2fの底部付近からサイホン2gを用いて油水を汲み上げ、水圧分散ストレーナー2hを通流させて第三の浮上油分離槽2iに流入する操作を繰り返すことにより、最終槽である第三の浮上油分離槽2iに油分が到達しないように防止するとともに、油水中の極微細な油分も、水分との比重差により、完全に油膜として油水の上部表面に浮上分離する。

【0034】次に、浮上分離した油水表面の油膜を除去する油吸着フィルター3について説明する。

【0035】図5は、油吸着フィルター3に用いる水流分散板3cを示す平面図であり、図6は、油吸着フィルター3の概略構成を示す説明図である。

【0036】図5に示すように、水流分散板3cは、多孔を有する円板体である。

【0037】また、図6に示すように、油吸着フィルター3は、有頂円筒状のケース体3b中に、水流分散板3cを装着し、その下流に活性炭を用いた吸着材3dを充填し、更に下流に、吸着材3dに吸着した油分の流出を防止するポリプロピレン製の円板体である吸着材流出防止フィルター3eを装着している。

【0038】吸着材3dは、谷口商会株式会社が製造・販売元である、活性炭を主原料とするスミレイを使用している。スミレイは、一般的の油吸着マットに用いる吸着素材の孔径（通常の油吸着マットの孔径：200μm～600μm）よりも小さく、大径孔で20μm～50μm程度の大きさであり、薄膜状となっている油分の吸着に適している。

【0039】なお、本例の油吸着フィルター3は、水流分散板3c、吸着材3d及び吸着材流出防止フィルター3eからなるセットを二セット、ケース体3b中に装着している。このセットの交換が可能となるように、ケース体3bは、強固な金属等を用いて形成することが望ましい。

【0040】油膜が上部に浮上している油水を、油吸着フィルター3に流通すると、水流分散板3cに油水がぶつかって分散し、吸着材3d中に略均等に油水が流通して、油膜が吸着材3dに吸着される。そして、吸着材流出防止フィルター3eから流通した油水が、さらに二セット目の水流分散板3c、吸着材3d、吸着材流出防止フィルター3eを流通し、完全に油膜が吸着されて油水から除去される。

【0041】したがって、除去の困難な数ミクロン単位の微細な油膜として、油分が油水表面に浮上分離している場合であっても、油吸着フィルター3に油膜を吸着し、規定された排水基準値（鉱物油5ppm、植物油30ppm）以下まで油分が除去されるとともに、油膜も残留しない清澄な処理水を現場に放出することができる。

【0042】次に、比重差によって油分が浮上分離せず、油水中に残留する油分を除去する水中油分除去装置4について説明する。

【0043】水中油分除去装置4は、図1に示すように、攪拌装置4aを有する攪拌タンク4bに凝集剤B投入用のホッパー4cと、凝固剤C投入用の液量確認タンク4dとを装備し、ろ過ポンプ4eを介してバッグフィルター4fを配して成る。図中4gは、凝固剤Cのタンクであり、このタンク4gから凝固剤C液をポンプ4hで吸い上げて、液量確認タンク4dにて、液量を確認し、攪拌タンク4bに投入する。また、図中4iは、洗浄剤Aのタンクであり、適量ポンプ4jにて、攪拌タンク4bに適量の洗浄剤Aを投入する。

【0044】洗浄剤Aは、有限会社S・N・E総合研究所が製造した商品名イオン洗浄剤SNF-GF88を用いた植物性の洗浄剤である。また、凝集剤Bは、食可能な海草等の植物から抽出したエキスを主成分とした粉状体であり、凝固剤Cは、カチオン系の食品添加物をメインとした液体である。凝集剤B及び凝固剤Cとも、株式会社ウェステックが製造元で、株式会社シンドウが販売元のNBP-A、BC9-B（二つセットで総称ミキシク）を使用している。

【0045】浮上油分離回収装置2にて、比重の軽い油分が浮上分離された油水を、配管を通じて浮上油分離槽2a, 2f, 2iから水中油分除去装置4の攪拌タンク4bに流入し、洗浄剤Aを投入して油水をリエマルジョン化して油水中に残留している油分を安定なミセルとし、更に、凝集剤B及び凝固剤Cとを投入してミセルとなっている油分を完全にフロック化したうえ、このフロック化した油分をバッグフィルター4fで除去し、油分の残留しない、完全に清澄化した処理水を水中油分除去装置4の放出口から現場に再放出することができる。

【0046】また、洗浄剤A、凝集剤B及び凝固剤Cの全てが環境に影響を与えない天然物を用いていることから、フロック化した油分を無害固形物として、安心して廃棄・除去することができる。

【0047】浮上油分離槽2a, 2f, 2iにおいて、浮上した油分も、水中油分除去装置4において、フロック化した上、除去することも可能である。すなわち、浮上油分離槽2a, 2f, 2iの下部から充填水を供給し、浮上油を浮上油分離槽2a, 2f, 2iの上部に押し上げて、浮上油分離槽2a, 2f, 2i上部に設けた上部回収パイプ7により水中油分除去装置4の攪拌タンク4bに流入し、油分をフロック化したうえ回収し、分離廃棄する。

【0048】なお、浮上油分離回収装置2と水中油分除去装置4を流通弁を介して配管7で連結した循環手段を設け、汚れてきた浮上油分離槽2a, 2f, 2i中の充填水を、流通弁を介したパイプ8を通じて水中油分除去装置4に循環させ、清浄な初期充填水として再利用している。

【0049】次に、図7は、油水分離除去装置1の他の実施例について説明する。図7は、浮上油分離回収装置

2及び水中油分除去装置4を配管7で連結して一つのラインを構成し、ハウジング内に設置した油水分離除去装置1を示す平面図である。

【0050】図7に示すように、油水分離除去装置1は、浮上油分離回収装置2の第一、第二及び第三の浮上油分離槽2a, 2f, 2iをL字型に設置し、この浮上油分離回収装置2の第一、第二及び第三の浮上油分離槽2a, 2f, 2iを流通弁を介して配管7で攪拌タンク4bに連結し、水中油分除去装置4を浮上油分離回収装置2に近設して設け、コンパクトにハウジング内に設置している。

【0051】このため、油水分離除去装置1を、車両や船舶に搭載することが容易となり、事故等によって汚染された海水や湖沼の事故現場まで、車両や船舶に搭載した油水分離除去装置1を運び、現場において、油水を規定された排水基準値以下まで浄化し、油膜の残らない清澄化した処理水を現場に戻すことができる。

【0052】

【発明の効果】本発明は、上記した構成となっているので、以下に示す効果を奏する。油水分離除去装置は、油分の多い油水の表面附近の油水を汲み上げて処理するため、油水が海水等の広範囲に広がっている場合であっても、処理する油水量を少なくして、処理コストを低減することができる。

【0053】油水分離除去装置の浮上油分離回収装置は、油分と水分との比重差により油水中の油分を浮上分離させて回収するとともに、油水中な微細な油分も油膜として浮上分離させて除去する。また、油膜として浮上分離しない油分が万一、油水中に残留した場合であっても、油吸着フィルターを用いて除去し、規定された排水基準値以下まで油水を完全に浄化し、油膜としても油分が残留しない清澄な処理水を現場に戻すことができる。

【0054】更に、油水分離装置の水中油分除去装置は、浮上油分離回収装置で浮上分離されない油水中に残留する油分を無害固形物として回収・除去し、規定された排水基準値以下まで、完全に清澄化した処理水を現場に戻すことができる。

【0055】油水分離除去装置は、コンパクトにハウジング内に設置することが可能であり、船舶等の移動体に容易に搭載することができるため、事故現場まで油水分離除去装置を運んで、漏油の事故現場において、低コストで、環境に影響を与えることなく、海水等の油水中の油分を完全に除去し、規定された排水基準値以下まで油水を清浄化するとともに、油膜としても油分の残らない完全に清澄化した処理水を現場に再放出することができる。

【図面の簡単な説明】

【図1】本発明の一実施例を示す、油水分離回収装置の概略構成を示す説明図。

【図2】(a)はフロートポンプの概略構成を示す平面

図、(b)は、フロートポンプの側面図。

【図3】本発明の一実施例を示す、浮上油分離回収装置の概略構成を示す説明図。

【図4】抵抗板の概略構成を示す斜視図。

【図5】油吸着フィルターに用いる水流分散板の概略構成を示す平面図。

【図6】油吸着フィルターの概略構成を示す説明図。

【図7】本発明の他の実施例を示す、浮上油分離回収装置及び水中油分除去装置を一ラインで連結した油水分離除去装置の概略構成を示す説明図。

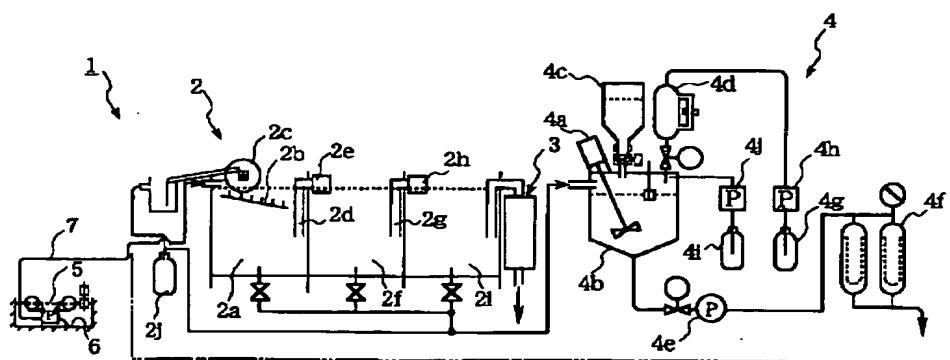
【符号の説明】

- 1 ; 油水分離除去装置
- 2 ; 浮上油分離回収装置
- 2 a ; 浮上油分離槽
- 2 b ; 抵抗板
- 2 c ; オイルスキマー
- 2 d ; サイホン
- 2 e ; 水圧分散ストレーナー
- 2 f ; 浮上油分離槽
- 2 g ; サイホン
- 2 h ; 水圧分散ストレーナー
- 2 i ; 浮上油分離槽
- 2 j ; 回収タンク
- 3 ; 油吸着フィルター
- 3 a ; サイホン
- 3 b ; ケース体

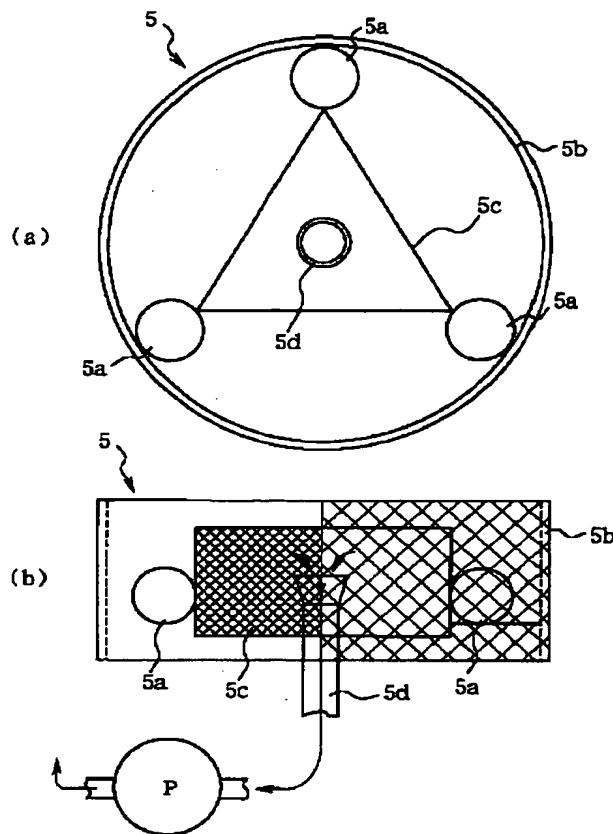
- * 3 c ; 水流分散板
- 3 d ; 吸着材
- 3 e ; 吸着材流出防止フィルター
- 4 ; 水中油分除去装置
- 4 a ; 搅拌装置
- 4 b ; 搅拌タンク
- 4 c ; ホッパー
- 4 d ; 液量確認タンク
- 4 e ; ろ過ポンプ
- 10 4 f ; バッグフィルター
- 4 g ; 凝固剤Cタンク
- 4 h ; ポンプ
- 4 i ; 洗浄剤Aタンク
- 4 j ; 適量ポンプ
- 5 ; フロートポンプ
- 5 a ; フロート部
- 5 b ; ごみ除け網
- 5 c ; ごみ除け網
- 5 d ; 吸い込み口
- 20 6 ; 排水ビット
- 7 ; 上部回収パイプ
- 8 ; パイプ
- 20 20 ; 平板
- 21 ; フィルター
- 22 ; 側板

*

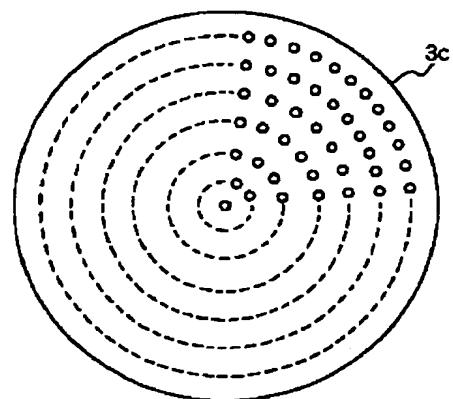
【図1】



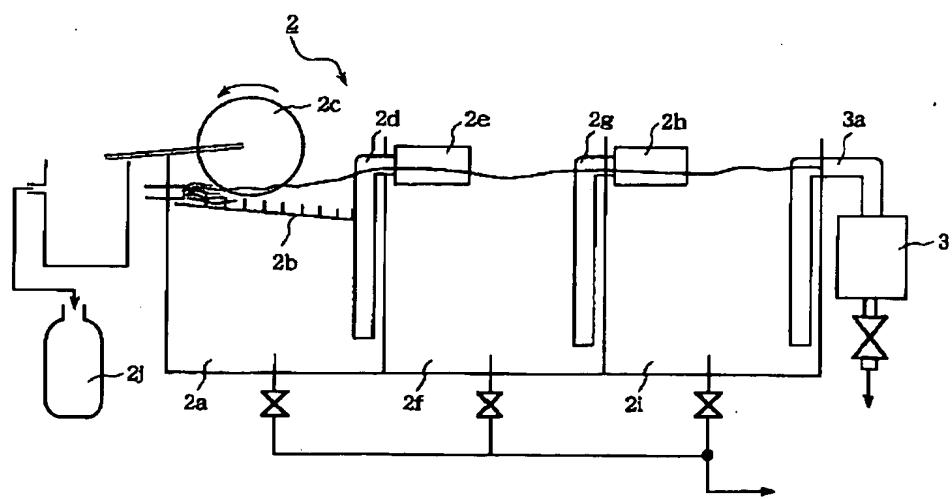
【図2】



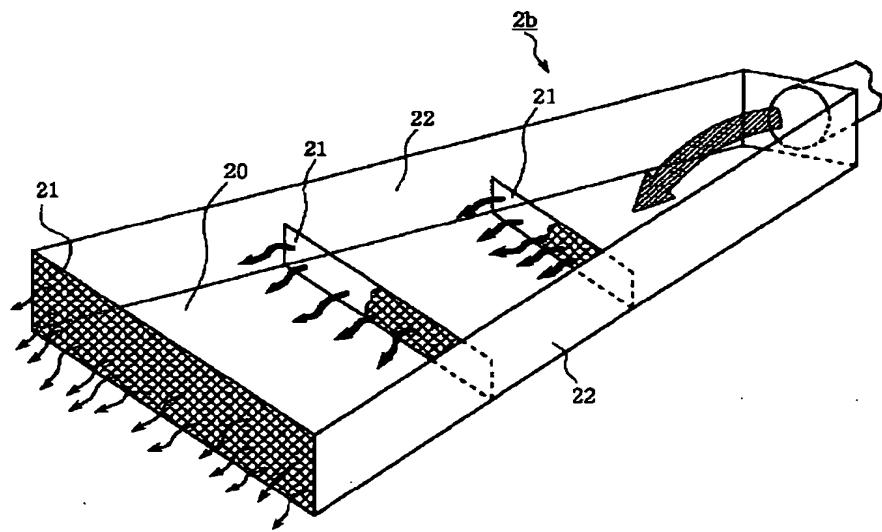
【図5】



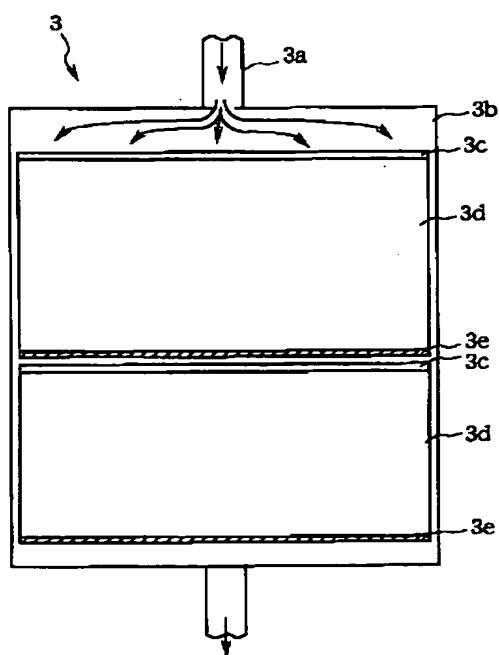
【図3】



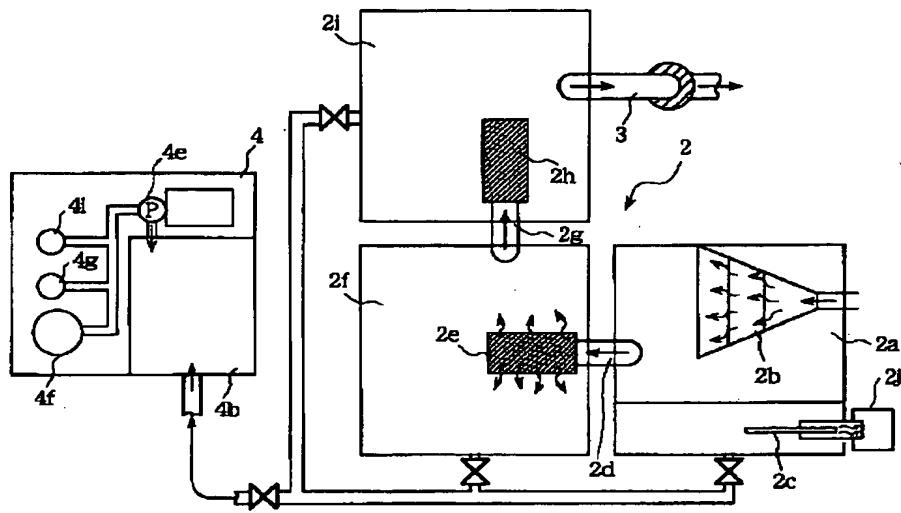
【図4】



【図6】



【図7】



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